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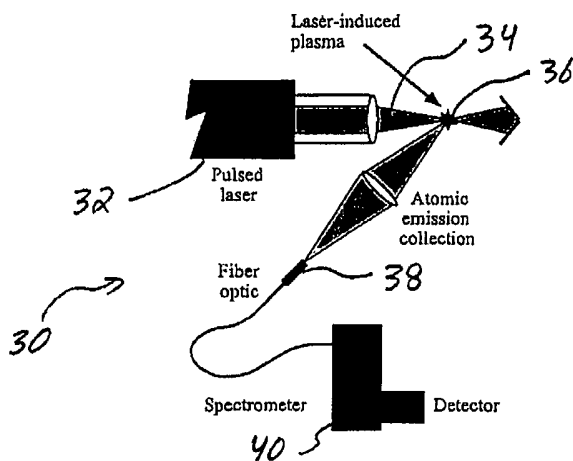
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- (71) Applicants (for all designated States except US): SYSTEMS PLANNING AND ANALYSIS, INC. [US/US]; 2000 N. Beauregard Street, Suite 400, Alexandria, VA 22311 (US). THE UNIVERSITY OF MARYLAND [US/US]; 6200 Baltimore Avenue, Suite 300, College Park, MD 20742 (US).
- (72) Inventors; and  
(75) Inventors/Applicants (for US only): BUCKLEY, Steven, G. [US/US]; \* (US). BALDWIN, Christopher, S. [US/US]; \* (US). KRATZSCH, Kyle [US/US]; \* (US).
- (74) Agent: BHARGAVA, Adesh; Dykema Gossett PLLC, 1300 I Street, N.W., Third Floor West, Washington, DC 20005-3553 (US).
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(54) Title: LIBS SYSTEM AND METHOD FOR ENGINE EXHAUST MONITORING



(57) Abstract: A trace species detection System for engine health monitoring, the system including a laser (32) for generating a laser beam (34), and optics for focusing the laser beam into an exhaust plume of an engine for thereby creating a spark in the exhaust plume. The System further includes spectral analysis instrumentation (40) for detecting light emissions from the spark, and statistical processing instrumentation (100) for analyzing data from the spectral analysis instrumentation (40) for thereby identifying and quantifying specific particles within a volume of the spark. The invention also provides a method of monitoring the health of an engine, the method including generating a laser beam, focusing the laser beam into an exhaust plume of the engine for thereby creating a spark in the exhaust plume, detecting light emissions from the spark, and analyzing data from the detection for thereby identifying and quantifying specific particles within a volume of the spark.

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**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/US05/05769

<p><b>A. CLASSIFICATION OF SUBJECT MATTER</b>                  IPC(7) : G01J 3/443; G01N 21/63                  US CL : 356/318                  According to International Patent Classification (IPC) or to both national classification and IPC</p>													
<p><b>B. FIELDS SEARCHED</b>                  Minimum documentation searched (classification system followed by classification symbols)                  U.S. : 356/317, 318</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)                  Please See Continuation Sheet</p>													
<p><b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b></p> <table border="1"> <thead> <tr> <th>Category *</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>US 5,490,490 A (WEBER et al.) 13 February 1996 (13.02.1996), see the entire document.</td> <td>1-20</td> </tr> <tr> <td>A</td> <td>US 5,979,423 A (POINDEXTER et al.) 09 November 1999 (09.11.1999), see the entire document.</td> <td>1-20</td> </tr> <tr> <td>A</td> <td>JP 2002-5833 A (TOSHIBA CORP.) 09 January 2002 (09.01.2002), see the entire document.</td> <td>1-20</td> </tr> </tbody> </table>		Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	A	US 5,490,490 A (WEBER et al.) 13 February 1996 (13.02.1996), see the entire document.	1-20	A	US 5,979,423 A (POINDEXTER et al.) 09 November 1999 (09.11.1999), see the entire document.	1-20	A	JP 2002-5833 A (TOSHIBA CORP.) 09 January 2002 (09.01.2002), see the entire document.	1-20
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<p>* Special categories of cited documents:</p> <table border="0"> <tr> <td>"A" document defining the general state of the art which is not considered to be of particular relevance</td> <td>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"E" earlier application or patent published on or after the international filing date</td> <td>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"O" document referring to an oral disclosure, use, exhibition or other means</td> <td>"&amp;" document member of the same patent family</td> </tr> <tr> <td>"P" document published prior to the international filing date but later than the priority date claimed</td> <td></td> </tr> </table>		"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"E" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family	"P" document published prior to the international filing date but later than the priority date claimed			
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<p>Date of the actual completion of the international search                  25 August 2005 (25.08.2005)</p>	<p>Date of mailing of the international search report  <b>26 OCT 2005</b></p>												
<p>Name and mailing address of the ISA/US                  Mail Stop PCT, Attn: ISA/US                  Commissioner for Patents                  P.O. Box 1450                  Alexandria, Virginia 22313-1450                  Facsimile No. (703) 305-3230</p>	<p>Authorized officer                  F. L. Evans <i>Lydia Dele For</i>                  Telephone No. (571) 272-2800</p>												

**INTERNATIONAL SEARCH REPORT**

International application No.  
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Continuation of B. FIELDS SEARCHED Item 3:  
EAST  
search terms: LIBS, laser plasma, exhaust, engine, spark